Effect of Solder Flux Residues on Corrosion of Electronics

Flux from 'No Clean' solder processes can cause reliability problems in the field due to aggressive residues, which may be electrical conducting or corrosive in humid environments. The solder temperature during a wave solder process is of great importance to the amount of residues left on a PCBA. 'No Clean' fluxes typically contain about 2 wt\% solids, 96 wt\% alcohol, 1 wt\% water and 1 wt\% additives. It is assumed that all aggressive additives and solids (acids and ester oil compounds) evaporate during the solder process, which is the reason for the name 'No Clean', which means that no cleaning after the solder process is required. In some cases, however, this statement is not correct. Experiments with 'No Clean' wave solder flux have been performed, and the results show, that the solder temperature plays an important role; temperatures below 170°C cause more flux residues than solder temperatures above about 235°C. The reason is that the acid part of the flux does not evaporate completely at the lower temperatures, and as acid can be dissolved in water, leakage currents and product failures can occur in humid environments. Also remaining ester oil can act as a site for entrapment of dust, which can act as a humidity absorber. The experiments have been made on SnPb wave solder flux, later experiments will show if the problems are less for Lead-free reflow and wave soldering, because the solder temperature is about 20°C higher. Furthermore an example of failure after humidity testing and use in the field, consequences and recommendations are given. Failures, caused by harsh customer environments, are not covered in this paper.

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